I. Title of Project- John Day Dam North Count station modification evaluation
Project leader - Larry Beck
Agency - Corps of Engineer - Fisheries Field Unit
Phone - 503-374-8801
Duration on dates of Project - 1 March 2005- 15 October 2005

II. Goal(s)

Determine if modifying hydraulic conditions at the north count station at John Day may reduce counting problems.

Methodology;

Counting slot will be modified and tested to see if the ratio of total observed to total passing is reduced.

Relevance

Biop action 117 page 9-115 states "**The Corps shall evaluate adult count station facilities and rehabilitate where necessary at all project to either minimize delay of adults or minimize counting difficulties that reduce count accuracy**."

Basham, 2004 states **"The passage of adult fish through the north shore counting station has been and continues to a problem, with a high percentage of fish falling back through the counting window (especially late summer and fall run fish). A modification of the counting station or a change in the upstream exit section weirs is required. During the past seasons, there has been a large fish count differential between The Dalles Dam, John Day Dam, and McNary Dam. 2003 appears to be no different, with more steelhead counted a John Day than The Dalles Dam (+23,000) and about (+58,800) more at John Day than McNary**."

III. Background

Problem description

John Day fish ladders have a history of fish passage problems. Passage problems may be caused by diffusers (Gauley et al 1966), temperature differences (Murray 1971, Bell 1991), hydraulic conditions, or lighting conditions (Long. 1959). One condition or a combination of these conditions may be delaying fish. Donaldson (1969) noted that when count stations are located a distance from the forebay they are "greatly troubled by instances of leaping salmon (as well as turn backs)". He said that when the count stations at Bonneville were moved, the jumping stopped. He also noted that at John Day North ladder too many salmon were leaping out of the ladder and falling 60 to 70 ft.

Modifications to the ladders have been made in attempts to reduce the problems. In the winter of 1970-71, the upper portion of the south ladder was modified to vertical slots-and-pools to improve shad passage. The following winter, similar

modifications were completed on the north ladder (1971 Annual Fish Passage Report). Weaver et al. (1972) observed fish jumping and documented mortalities. Steve Rainey (1989) and Gary Fredricks (1990) documented holding and jumping in the south ladder at the transition between the vertical slot area and the overflow section.

In addition, the upper diffuser pool of the south ladder was modified to reduce fish holding areas (Summit Technology, 1992). Netting over the fishway was installed at both John Day Dam's fish ladders to keep adult salmonids from jumping out of the ladder. Even after these modifications, Cordie (1995) and Jonas et al. (1994) observed jumping and holding in this upper portion of the ladder. These types of problems have not been observed at The Dalles or Bonneville fish ladders in recent years. In 1998 counting problems were brought to the attention of biologists when John Day Dam steelhead counts were 40,000 higher than The Dalles Dam, the dam that the steelhead have to pass to get to John Day Dam (Beck 2003). In 2002, John Day south ladder was modified to an "Ice Harbor" type fishway. Testing in 2003 showed that the improvements decreased the jumping (Jonas et al, 2004 in prep) and decreased down-to-net ratios at the count station (Table 1). Operation of the removable sills at the top of the ladders in 1996 and 1997 showed that on the south ladder there was a down-to-up ratio decreased when the sills were open but the same test on the north ladder did not show a difference in the down-to-up ratios (Beck, 2003). Therefore, it is possible that if the 2002 John Day south ladder modification was done to the north ladder without moving the count station, the modification may decrease the jumping problem but not correct the counting problem. Moving the fish count station would be a costly change.

Objectives

Modify the weir above the count station to provide only a downstream flowing current without eddies or upward flows and a straight path through the count station to the next pool. The modification would include fencing the path to keep the fish within the path and plating the floor diffuser to eliminate a potential confusing factor.

Determine if the total observed-to-total passing ratios at John Day Dam decrease compared to previous year ratios.

or

Determine with a random block design test if the modified condition reduces total observed-to-total passing ratio.

Methodology

Description of proposed studies

I propose to block all orifices in weir 249 (the first weir upstream of the count station) and cut a slot directly in front of the count slot so that water flowing through the slot from the floor to the water surface is directed in a downstream direction at the counting window slot (Figure 1). The path to the newly constructed slot will be fenced by a chute (Figure 2) to guide the fish past weir 249. The area between the first weir and the counting window has a floor diffuser. Between the fences the diffuser will be covered with a solid plate. Data from a hydraulic model of fish ladders at John Day Dam, Oregon show that at forbay elevation of 262 flow through the count station would be 27.2 cfs with the sills in and 51.2 cfs with the sills out. The area of the slot would be 6ft high and 1.5 ft wide for 9 square ft. The slot width at the count station would be 4 ft or 24 square ft. The flows will range from range from 3 to 5.7 ft/sec at the start of the slot and 1.1 to 2.1 at the count station depending if the sills are in or out. This will create a direct path that has a constant downstream flow. All orifices and the newly constructed slot will have guides on them so that if this modification does not work it can be returned to its original condition at any time without dewatering. The concrete ramps upstream and downstream to the count station will be removed and replace with ramps made from grating so that water will flow under the count station slot as it did in its original design.

The effect of this modification will be evaluated by comparing yearly total observed to total passing ratios. A ratio of 4 to 1 or less would be an indication that we may not have to move the count station.

The following is scanned from some notes found in Ivan Donaldson's files. They show exiting conditions and the proposed changes. The second figure shows how the slot would be made that would be installed in the area above the count and through the diffuser area.

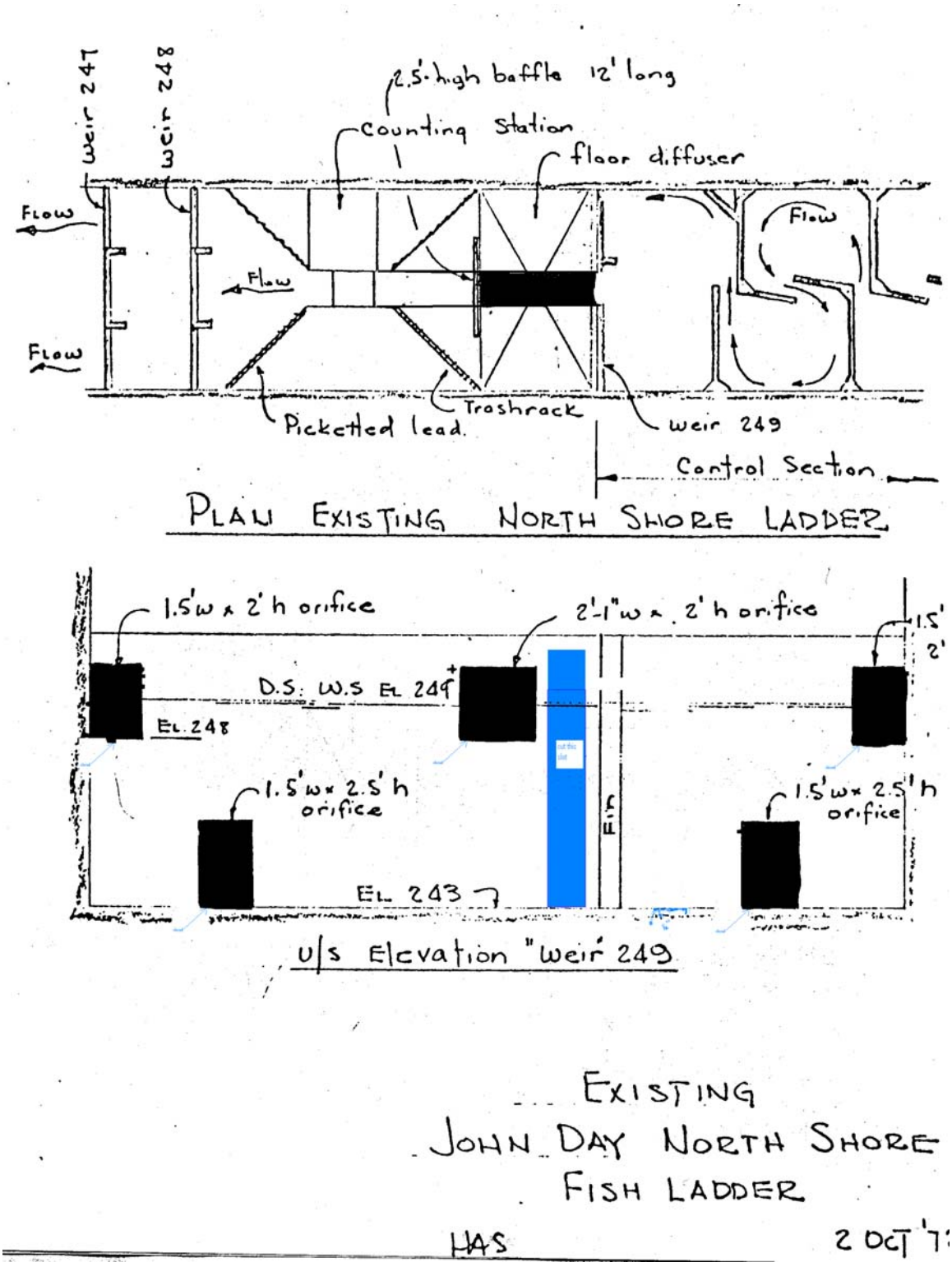

Figure 1. Overhead view of the current count slot and a side view of the first upstream weir above the count station. The orifices that will be closed are in black and the proposed new slot is in blue.

Justification of Proposed study area

The north ladder at John Day has a seven-year average down to net ratio for steelhead (1997-2003) of 8.9, indicating that for 8.9 steelhead observed, only one steelhead passes upstream. For salmonid, the rate is 5.7. This compares to the south ladder's rates of 1.8 and 1.4 (1.1 and 1.1 after modification Table 1).

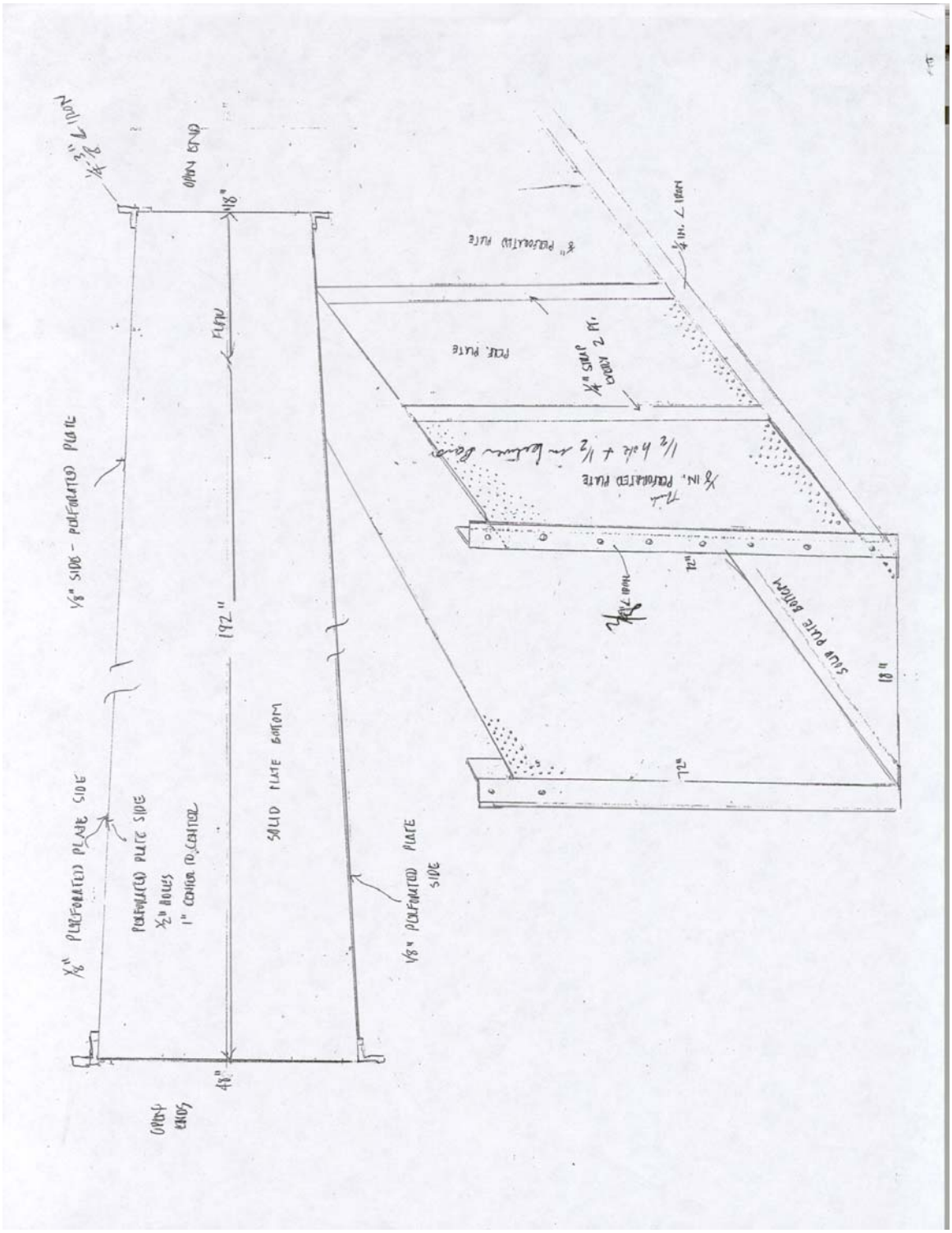

Figure 2. Overhead and head-on view of the proposed slot between the count station and the first weir above the count station.

Table 1. Down to total observed steelhead and total salmonids

	John Day North ladder		John Day South ladder	
	Steelhead	Total salmonids	Steelhead	Total steelhead
1997	8.5	5.2	1.9	1.4
1998	7.1	5.2	2.1	1.6
1999	10.8	8.0	2.1	1.5
2000	10.8	5.7	2.1	1.5
2001	9.3	4.9	1.7	1.4
2002	7.6	5.1	1.7	1.4
2003	8.5	5.7	1.1	1.1
2004				
Average	8.9	5.7	1.8	1.4
Years	7	7	7	7

Method of analysis

Either of the two evaluations will be conduced depending on funding available and important placed on the evaluation. The equipment will be installed and left in until it is found have the same or high total to net ratios or the equipment will be install and removed in two or three-day blocks for a 6-day block study. The study would be conducted in spring, summer, and fall.

Limitation to proposed methods and expected difficulties

If the block test is used the test is a stronger statistical comparison but the cost increase with the crane time required. If yearly comparison is used the affect has to be dramatic to show that the location of the count station would not have to be moved.

Expected results and applicability

I expect to find the modification to the condition will reduce the counting problems and so then the upper section could be just modified to the new Ice Harbor type weir eliminating the need to move the count station.

Schedule

Start of project - 21 June 21, 2004
Plan project and write proposal – 15 July 2004
Hydraulic and engineering analysis - 15 July 2004 –1 October 2004
Modifications of weir and building of equipment December to 15 March 2005.
Collect information - 15 March to 30 October 2005

Writing of draft report –30 October, 2005 to 1 Febuary, 2006
Draft sent to review- 2 February – 1 March, 2006- 1 April 2006
Review comment received back by
Final sent to Johnson

Facilities and Equipment.

Crane to install and remove chute according to which is test chosen.

Requirements-

Use of the total observed to total passing counts that are current being recorded at the north and south count station at Bonneville, The Dalles and John Day dams.

Project or system operating impacts; special services to be requested.

The project will be required to supply requested information in at timely manner.

1. Project person hours required to accomplish required fisheries work.
2. Alternatives solution to accomplish work required for fisheries work
3. Impacts to project and work force to accomplish required work.

Crane service will be required to install and remove chute.

IV. List of Personnel and Project Duties

Project leader	Larry Beck
Program assistant	none